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Final Proposed Plan
Army Materials Technology Laboratory

Task Order 1
Remedial Investigation/Feasibility Study

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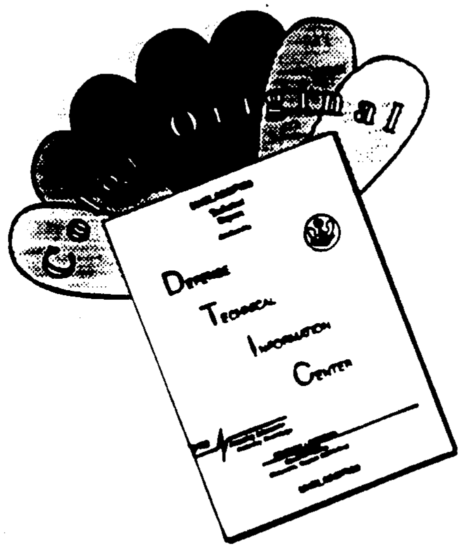

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EPA Region I
Superfund Program
Army Materials Technology Laboratory Site
Watertown, Massachusetts

Final Proposed Plan

April 1996

Army Proposes Cleanup Plan for Outdoor Areas of the Army Materials Technology Laboratory (MTL) Superfund Site

The U.S. Army is proposing a cleanup plan, referred to as a preferred alternative, to address outdoor contamination at the MTL **Superfund** site in Watertown, Massachusetts. The Proposed Plan recommends one of the cleanup options from among those that were evaluated during the **Remedial Investigation (RI)*** and **Feasibility Study (FS)** performed for the site. In accordance with Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**, the Army is publishing this Proposed Plan to provide opportunity for public review and comment on the cleanup alternatives, known as **remedial alternatives**, under consideration for the site. The Army is soliciting comments on the proposed level of cleanup. The Army will consider public comments as part of the final decision-making process for selecting the cleanup remedy for the site.

Because of the complexity of this site, the site has been divided into three distinct **operable units**, which are being handled separately. The first operable unit is for the outdoor areas of the site, specifically soil and **groundwater**; this document addresses this operable unit. This operable unit does not address any contamination as a result of releases of petroleum, oil, or lubricant (POL), because remedial actions under CERCLA do not extend to POL. Any actions required to address POL are under the jurisdiction of the Massachusetts Department of Environmental Protection (MADEP). The second operable unit is for the remediation of site buildings, which is being performed under state cleanup authority. A **Massachusetts Contingency Plan** (MCP) Phase III **Remedial Action Plan** for the site buildings was submitted to MADEP in January 1996. The third operable unit relates to the Charles River **surface water** and **sediments**; an RI/FS will be undertaken for this operable unit. Cleanup of the Charles River, if required, will be implemented by the Army under CERCLA with U.S. Environmental Protection Agency (EPA) oversight.

For the MTL Outdoor Area Operable Unit, a preferred alternative and a contingency alternative have been identified. The preferred alternative includes: 1) excavating contaminated soil; 2) on-site treatment of the soil by **chemical oxidation**; and 3) backfilling the excavations with the treated soil. The contingency alternative includes: 1) excavating contaminated soil; 2) off-site disposal or reuse of the soil; and 3) backfilling the excavations with clean soil. The preferred and contingency alternatives are described in greater detail starting on page 9 of this document. In addition to implementation of either the preferred or contingency alternative, additional

*Note: Words that appear in **bold** print in this document are defined in the glossary on pages 29-31.

soil identified as containing metals contamination with unacceptable risk to human health or the environment will be excavated and disposed off-site.

This Proposed Plan:

- Explains the opportunities for the public to comment on the remedial alternatives.
- Includes a brief history of the site and the principal findings of site investigations.
- Provides a brief description of the preferred alternatives and other alternatives evaluated in the FS.
- Outlines the criteria used to propose an alternative for use at the site, and briefly analyzes whether the alternatives meet each criteria.
- Presents the rationale for the preliminary selection of the preferred alternative.

To help the public participate in reviewing the cleanup options for the site, this document also includes information about where interested citizens can find more detailed descriptions of the remediation process and the alternatives under consideration for the MTL site.

The Public's Role in Evaluating Remedial Alternatives

Public Informational Meeting

The Army will hold a public informational meeting on Tuesday, April 16, 1996 at 6:30 p.m. at the Building 36 auditorium, located at the MTL facility in Watertown, Massachusetts, to describe the preferred alternative and other alternatives evaluated in the FS. The public is encouraged to attend the meeting to hear the presentations and to ask questions.

Public Comment Period

The Army is conducting a 30-day public comment period from April 22 to May 22, 1996, to provide an opportunity for public involvement in the final cleanup decision. During the comment period, the public is invited to review this Proposed Plan and the RI and FS reports and to offer comments to the Army.

Public Hearing

The Army also will hold a public hearing, tentatively scheduled for Monday, May 13, 1996, to accept oral comments on the cleanup alternatives under consideration for the site. This hearing will provide the opportunity for people to comment on the cleanup plan after they have heard the presentations made at the public informational meeting and reviewed this Proposed Plan. The public will be informed of the date, time, and place of this hearing after its schedule has been firmly established.

Comments made at the hearing will be transcribed, and a copy of the transcript will be added to the site **Administrative Record**, which is available at the MTL facility and at the information repository location listed below.

Written Comments

If, after reviewing the information on the site, you would like to comment in writing on the preferred alternative, any of the other cleanup alternatives under consideration, or other issues relevant to the site cleanup, please deliver your comments to the Army at the Public Hearing or mail your written comments (postmarked no later than May 22, 1996) to:

Jeffrey H. Waugh
U.S. Army Environmental Center
Base Closure Division
Building E4480
APG-EA, MD 21010-5401
(410) 671-1615

Army's Review of Public Comment

The Army will review comments received from the public as part of the process of reaching a final decision on the most appropriate remedial alternative, or combinations of alternatives, for cleanup of outdoor areas of the MTL site. The Army's final choice of a remedy will be issued in a **Record of Decision (ROD)** for the site. A document, called a Responsiveness Summary, that summarizes the Army's responses to comments received during the public comment period will be issued with the ROD. Once the ROD is signed by the Director of the Office of Site Remediation and Restoration at EPA, it will become part of the Administrative Record, which contains the documents used by the Army to choose a remedy for the site.

Additional Public Information

Because this Proposed Plan provides only a summary description of the investigation of the MTL site and the cleanup alternatives considered, the public is encouraged to consult the Administrative Record, which contains the RI and FS reports and other site documents, for a more detailed explanation of the site and all of the remedial alternatives under consideration.

The Administrative Record is available for review at the following locations:

Army Research Laboratory Caretaker
395 Arsenal Street
Watertown, Massachusetts 02172-2700
(617) 753-3806
Hours:
Monday-Friday: 8:00 a.m. to 4:00 p.m.

Watertown Library
123 Main Street
Watertown, MA 02172
(617) 972-6436
Hours:
Monday - Wednesday, 9 a.m. to 9 p.m.
Thursday, 1 p.m. to 9 p.m.
Friday and Saturday, 9 a.m. to 5 p.m.
Sunday, 1 p.m. to 5 p.m.

Site History

The MTL facility has been in operation since 1816. It was established for the purposes of storage, repair, cleaning, and issue of small arms and ordnance supplies. Throughout the 1800s and until World War II, MTL's mission was continually expanded to include weapons development and production, and materials research experimentation and development. At the height of its activity (just after World War II), the site encompassed 131 acres with 53 buildings and structures and employed 10,000 people. In 1960, the Army's first nuclear materials research reactor was constructed, and it was used in research activities until its deactivation in 1970. Decommissioning of the reactor in accordance with the Nuclear Regulatory Commission standards has been completed.

An operational phaseout of the arsenal was begun in 1967. At that time, approximately 55 acres of land were sold to the town of Watertown, and 28.5 acres were transferred to the General Services Administration (GSA). The parcel sold to Watertown currently contains a shopping mall, condominiums, and a public park and playground. Land transferred to GSA has undergone various improvements, including paving in some portions.

MTL currently occupies 36.5 acres and is bounded on the north by Arsenal Street and a commercial area, on the west by commercial and residential property, and on the east by condominiums and a park. Part of the Superfund site includes an additional 11-acre area to the south of the site, along the Charles River, which contains a public roadway (North Beacon Street), a public park, and a yacht club. This property is owned by the Army and the Commonwealth of Massachusetts has been granted an easement to the property. MTL contains 15 buildings and 15 associated structures (see Figure 1).

Previous investigations that pertain to environmental conditions at MTL were completed between September 1968 and December 1987. In 1987, the Army Environmental Center (AEC) initiated additional environmental investigations under the Army's Installation Restoration Program (IRP). A Preliminary Assessment/Site Inspection completed in 1988 was performed as the first step of this program. In December 1988, MTL was included on a list of Department of Defense installations recommended for closure; this list was subsequently approved by Congress. In March 1989, AEC was assigned the responsibility for centrally managing the Base Realignment and Closure Environmental Restoration Program.

MTL was first listed by MADEP as a Location To Be Investigated on January 15, 1987. A Phase 1 Remedial Investigation (RI) was completed in April 1991. MTL was subsequently confirmed as a disposal site by MADEP on January 15, 1992. A Phase 2 RI was completed in December 1993. In July 1993, the site was proposed for inclusion on the **National Priorities List (NPL)** under Superfund. It was added to the NPL on May 30, 1994. The installation was officially closed on September 29, 1995.

Cleanup Activities to Date

Although unrelated to the Superfund process, several cleanup activities have taken place at the MTL site. In 1991, six on-site underground storage tanks were removed. Also in 1991 during the RI, a fuel oil leak was discovered at Building 227. A leaking oil line was repaired and contaminated soil was excavated to a 14-ft depth next to the building. Excavation ceased when it was determined that building structural damage would occur under continued excavation. The excavation was backfilled after approval by MADEP. Residual contamination exists and continued cleanup efforts are under the jurisdiction of MADEP under the MCP. Because Section 101(14) of CERCLA contains an exclusion for petroleum, the cleanup of petroleum-contaminated soils at MTL is being conducted under MADEP jurisdiction and is not addressed in this Proposed Plan.

The Army has also completed decommissioning of the nuclear reactor and low-level radioactive waste has been removed. In 1993, sitewide radiological decontamination was completed to meet cleanup standards set by the Nuclear Regulatory Commission (NRC). Some asbestos removal has also taken place in some of the site buildings.

In addition to the work previously completed, the Army will be conducting remediation of chemical contamination of interior building surfaces. For more information on this, please refer to the Phase III Remedial Action Plan. Concurrent with this remediation, the Army will be removing any loose and/or flaking lead paint. The Army's effort will comply with the Department of Public Health's lead paint requirements. Additionally, the Army will provide lead paint notification as a property transfer requirement.

Results of the Remedial Investigation (RI)

The RI defines the nature and extent of contamination at the site. AEC/WESTON conducted field activities for the RI that included the collection and analysis of samples of groundwater, soil, sediment, surface water, storm sewers, sanitary sewers, indoor building surfaces, and indoor air quality. The findings of the field activities pertinent to this Operable Unit are summarized below.

1. Soil Investigation: Soil samples collected from beneath concrete floors in Buildings 43, 311, and 312 showed elevated concentrations of semivolatile organic compounds. Contaminant concentrations were generally highest at ground surface. Elevated concentrations of polynuclear aromatic hydrocarbons (PAHs) were detected in soil samples collected from borings completed in the grassy area between North Beacon Street and the Charles River. The highest levels of PAHs were detected adjacent to Buildings 39 and 227/60, and in the parking lot between Buildings 37 and 131. The

maximum value of total PAHs detected was 99 parts per million (ppm). Polychlorinated biphenyls (PCBs) were detected at levels above the EPA action level of 1 ppm (maximum concentration of 4.9 ppm) in two site locations, near structure 244/245 (propellant storage area), and at the eastern fenceline, approximately 100 feet east of the tennis courts. Analytical results showed that the total uranium activity in all soils was below the federal maximum allowable standards. Metals concentrations, primarily lead, had their highest concentrations reported in shallow (less than 1 foot) soil samples collected from immediately outside Buildings 39, 43, 311, 313, and 656, with a maximum concentration of 7,200 ppm. Pesticides were detected in surface soil samples, particularly in the grassy areas within the southeast and central portions of the site and along the southern fence line (maximum total pesticide concentration of 11 ppm). In regard to the soil removal at Building 227 from a fuel leak, analysis of excavated soils indicated the presence of fuel-related compounds. Soil was excavated until the structural integrity of the building was threatened. Residual fuel-contaminated soil remains and has yet to be fully characterized. Because Section 101(14) of CERCLA contains an exclusion for petroleum, the cleanup of petroleum-contaminated soils at MTL is being conducted under MADEP jurisdiction and is not addressed in this Proposed Plan.

2. Groundwater Investigation: With the exception of one well, all upgradient wells showed detectable quantities of chlorinated **solvents**, which suggests that off-site sources have caused or aggravated on-site groundwater contamination. Chlorinated solvents identified in these wells include tetrachloroethylene (PCE), trichloroethylene (TCE), and 1,1,1-trichloroethane (TCA), with a maximum total VOC concentration detection in a single well of 14,000 parts per billion (ppb). In addition, one upgradient well showed elevated concentrations of gasoline-related volatile organics.

Based on a site water table map, groundwater flow paths indicate the potential for groundwater to flow away from the site in an area in the northwest part of the site before flowing towards the Charles River. No evidence of on-site contamination migrating off-site was found in groundwater collected from on-site wells because the vast majority of contamination was detected in the upgradient wells. The farthest on-site downgradient wells bordering the Charles River showed the lowest level of contamination. Most likely, a groundwater divide exists under a short stretch of Arsenal Street near the northwestern corner of the site, but groundwater does not flow from the site to the north of Arsenal Street. For more information, please refer to Section 1 of the FS.

Chlorinated solvents, including TCE and PCE, were detected in groundwater samples collected from 13 on-site monitor wells. Monitor wells located in the western portion of the site reported the highest concentrations of TCE (93 ppb) and PCE (94 ppb). Few exceedances of drinking water standards occurred.

Elevated concentrations of 1,3-dimethylbenzene (1,700 ppb) and other xylenes (1,400 ppb) were detected in one well located in the central portion of the site. Based on a petroleum odor present during groundwater sampling, contamination is believed to be the result of a fuel release. Analytical results from nearby monitor wells suggest the elevated concentrations are restricted to the area around this well.

During drilling of a soil boring beneath the Building 36 parking lot, several inches of free product were observed at the water table. Analysis of a soil sample collected at the water table indicated the contaminant was a fuel oil product. The sample did not contain the more commonly known gasoline-related compounds, but it did contain certain compounds found in heavier oils. This oil may be resulting from a pipe release in the area of Building 227, as previously mentioned. Groundwater samples collected from downgradient monitor wells did not detect evidence of the product, indicating there has not been contaminant migration in this direction. Because Section 101(14) of CERCLA contains an exclusion for petroleum, any cleanup of petroleum-contaminated groundwater at MTL is being conducted under MADEP jurisdiction and is not addressed in this Proposed Plan.

3. **Storm Sewers Investigation:** The storm sewers contained little or no sediment; therefore, only liquid samples were obtained during the rain event. Sampling results indicate that the site contributes small amounts of some metals and pesticides to the storm sewer runoff. These metals include copper and zinc (maximum detected values of 600 ppb and 500 ppb, respectively), both of which exceed site background values and the typical urban runoff range for these metals. Pesticide concentrations exceeding background concentrations include alpha-, beta-, and delta-BHC, chlordane, DDE, and methoxychlor, with a maximum total pesticide detection value of 0.9 ppb. No radiological contamination was discovered in storm sewer runoff.

4. **Sanitary Sewers Investigation:** Uranium contamination was found in several manholes on North Beacon Street and Arsenal Street (maximum radiological value of 73 pCi/g). On Arsenal Street, uranium was found in a manhole connected to the drainlines from Building 43. Since uranium concentrations in two manholes upstream of Building 43 were lower, the contamination in the manhole connected to the drainlines from Building 43 appeared to have been augmented by former **sources** in Building 43. The storm sewer lines and sanitary sewer lines are separate systems; there are no sanitary sewer outfalls on-site from MTL to the Charles River.

In a separate remediation to remove radiological contamination, manholes along North Beacon Street, Arsenal Street, and exiting Buildings 312 and 43 were remediated. A subsequent radiological survey of the sewer line along Arsenal Street showed no remaining radiological contamination. The results are being reviewed by the NRC to determine if any additional measures are required.

Summary of Site Risks

A Risk Assessment (RA) was prepared as part of the RI for the MTL site. The RA determines the present and future potential risks to public health and the environment posed by the site, based on existing conditions as determined by the RI. Separate risk assessments were done for risks to human health and ecological receptors from site soils. The human health risk assessment was conducted for the entire site; the ecological risk assessment was conducted only for undeveloped areas of the site (the southern portion of the installation near the Commander's quarters and the 11-acre River Park on the south side of North Beacon Street). It was concluded that the major risk to public health and the environment could result from incidental ingestion and dermal contact with contaminated soils. Soil contaminants identified as requiring risk reduction include PAHs, pesticides, and PCBs. In addition, the ecological risk

assessment identified certain metals as contaminants of concern, but concluded that sitewide concentrations in soil are predominantly at normal background conditions. There are localized areas that may pose a risk to environmental receptors.

At the time the soil risk assessments were prepared, the future use of the site (commercial or residential) was undetermined. The site was divided into five different unit areas, as shown in Figure 1. The MTL installation was divided into four zones (called Zones 1-4). The fifth unit was the 11-acre park south of North Beacon Street (called River Park). Zones 1-3 represent developed areas of the site and Zone 4 and River Park represent undeveloped areas. The risk assessments evaluated each unit separately and determined contaminants of concern for each unit for each possible site reuse scenario. The human health risk assessment evaluated Zones 1, 2, and 3 for commercial and residential reuse; Zone 4 for residential reuse and public use; and the River Park for public use only. The ecological risk assessment evaluated only Zone 4 and River Park because these areas were considered the only potential ecological habitats at the site.

No risk assessment was performed for groundwater because of a lack of receptors. While some contamination is present in certain areas of on-site groundwater, this is not a current risk because the groundwater is not used as a water supply, and no significant migration of contamination in groundwater off-site is occurring. The Commonwealth of Massachusetts has classified site groundwater as a nondrinking water aquifer (GW-3), therefore there is no risk of exposure to human health. Groundwater does discharge from the site into the Charles River. Therefore, a model of contaminant contribution via groundwater to the Charles River was developed. This model, as presented in the FS, shows that no significant concentrations of contaminants migrate to the river from site groundwater. Hence, there is no apparent risk to human health or the environment from site groundwater. Based on the information above, no remediation of MTL groundwater is necessary.

A separate risk assessment was conducted for human exposure to the storm and sanitary sewer lines. The only applicable exposure pathway was for exposure of sewer workers. The assessment concluded that there was no significant risk to sewer workers from exposure to contaminants in the sewer water or sediments.

For a complete explanation of risks posed by contamination at the MTL site, please refer to the RA presented in Section 6.0 of the MTL RI report, as well as the separate terrestrial ecological risk assessment and the sewer risk assessment. These documents are available at the information repository at the Watertown Public Library.

Proposed Cleanup Objectives and Levels

Using the information gathered during the RI and FS, remedial response objectives were identified for cleanup of the MTL site. The cleanup objective for this site is to minimize the risks to human health and the environment posed by direct contact with and incidental ingestion of contaminated soils.

To meet this objective, site-specific cleanup levels were established that will be protective of public health and the environment. These levels were established by first

calculating risk-based cleanup goals to comply with the requirements of CERCLA as well as MCP requirements.

For human health, risk-based goals for 14 different compounds detected in soil were determined. With the exception of two compounds, the risk-based goals were all lower than local background concentrations so that the actual cleanup goals for these compounds are to background levels. The MCP and CERCLA do not require remediation to below background levels. Background concentrations were determined using soil data collected from numerous points off-site from the MTL property and from points along the northern property boundary.

An EPA-approved statistical evaluation of the background soil data set was used to calculate the Upper 90% Confidence Limit (UCL). The UCL calculated for each contaminant was used as the contaminant's background level, and hence the MTL site cleanup goal. For more detail on the statistical evaluation, please refer to Section 2 of the FS. Compounds for which specific cleanup goals have been set for the MTL site for human health include six pesticides, seven semivolatile organics, and one PCB. The two compounds for which background was not appropriate were the pesticide 4,4'-DDD and the PCB Aroclor 1260. The cleanup goal for 4,4'-DDD is risk-based, as the background value was below the risk-based cleanup goal for this pesticide. The cleanup goal for Aroclor 1260 is based on the EPA-issued cleanup levels for PCBs at Superfund sites.

For ecological risk, separate cleanup goals were determined for the undeveloped areas of the site for 6 pesticides, 11 semivolatile organics, 1 PCB, and 8 metals. The goals for semivolatile organics and the PCB were greater than those cleanup goals established for human health, and/or the cleanup goals exceeded concentrations detected on-site. Hence, these goals were not used because the greater risk from these contaminants is to human health. The metals cleanup goals were not included in the remediation plan, as discussed earlier, because the on-site metals concentrations are consistent with normal background levels. Any areas with metals contamination posing an unacceptable localized risk will be handled in the site remediation. For pesticides, instead of applying the cleanup goals sitewide, specific locations with unacceptable ecological risk were identified and included in the remediation plan. These areas will be remediated to the ecological cleanup goals for pesticides.

To be consistent with the site risk assessments, cleanup goals were determined for each site zone for each possible reuse scenario. The individual zone cleanup goals are summarized in Table 1. In the table, a "-" listed as the cleanup goal for a chemical indicates that the chemical was not a contaminant of concern for that particular zone or reuse scenario. The soil cleanup goals do not differ for the different future uses (i.e., commercial or residential) because background concentrations are used to set the cleanup goals. The future use scenario does determine which contaminants are to be remediated in the different zones because the risk assessments, based on commercial and residential reuse yielded different contaminants of concern. The remedial alternative selected for the site must achieve the appropriate cleanup levels for reducing contamination at the site.

Table 1

MTL Soil Cleanup Goals for Site Reuse (mg/kg)

Chemical	Zone 1 Commercial Reuse	Zone 1 Residential Reuse	Zone 2 Commercial Reuse	Zone 2 Residential Reuse	Zone 3 Commercial Reuse	Zone 3 Residential Reuse	Zone 4 Residential Reuse	Zone 4 Public Access	River Park
Benzo(a)anthracene	—	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
Benzo(a)pyrene	—	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Benzo(b)fluoranthene	—	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
Benzo(k)fluoranthene	—	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
Chlordane	—	1.5	—	1.5	—	1.5	1.5	1.4	1.4
Chrysene	—	11.1	—	11.1	11.1	11.1	11.1	11.1	11.1
4,4'—DDD	—	—	—	—	—	—	2.5E-01	13.7	13.7
4,4'-DDE	—	3.9E-01	—	—	—	—	3.9E-01	1.4E-01	1.4E-01
4,4'-DDT	—	6.0E-01	—	—	—	—	6.0E-01	1.7E-01	1.7E-01
Dibenz(a,h)anthracene	—	—	—	2.7E-01	—	2.7E-01	2.7E-01	—	2.7E-01
Dieldrin	—	5.6E-02	—	5.6E-02	—	—	5.6E-02	3.5E-01	3.5E-01
Heptachlor epoxide	—	3.5E-01	—	3.5E-01	—	—	3.5E-01	—	—
Indeno(1,2,3-cd)pyrene	—	—	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Aroclor 1260	—	1.0	—	1.0	—	1.0	1.0	1.0	—

Note: The cleanup goals correspond to soil background concentrations, with the exception of 4,4'-DDD, which is risk-based, and Aroclor 1260, which is based on EPA guidance. Pesticide cleanup goals for Zone 4 Public Access and River Park are based on ecological risk.

The Preferred Alternative

The selection of the preferred cleanup alternative for the MTL site, as described in this Proposed Plan, is the result of a comprehensive evaluation and screening process. The FS for the site was conducted to identify and analyze the alternatives considered for addressing contamination at the site. The FS report for the MTL site describes the alternatives considered, as well as the process and criteria used to narrow the list to six potential remedial alternatives to address soil contamination. (For details on the screening methodology, see Sections 3 and 4 of the FS.) The following sections describe the preferred alternative and the other alternatives retained for detailed analysis.

In the FS, all alternatives were analyzed and costs determined for the three possible site reuse scenarios (as developed previously by the Watertown Arsenal Reuse Committee's approved MTL Reuse Plan). These scenarios are as follows:

- Scenario 1 - Commercial reuse for developed areas (Zones 1-3) and public access for undeveloped areas (Zone 4 and River Park).

- Scenario 2 - Residential reuse for developed areas and public access for undeveloped areas.

- Scenario 3 - Mixture of commercial and residential reuse for developed areas (commercial reuse for Zones 1 and 2 and residential reuse for Zone 3) and public access for undeveloped areas.

These scenarios are fully defined in Section 3 of the FS. The level of required soil remediation for Scenarios 1 and 3 is the same; approximately 23,700 cubic yards of soil would require remediation. Scenario 2 requires approximately a 20% increase in the amount of soil to be remediated (approximately 28,300 cubic yards) from Scenarios 1 or 3.

Reuse Scenario 3 is consistent with the Town of Watertown's intended future use of MTL as outlined in the Reuse Plan. The Reuse Plan was developed by the Arsenal Reuse Committee and approved by the Watertown Town Council. This reuse scenario will be used in establishing specific soil cleanup goals in each zone and determining the soil areas to be remediated. Table 2 summarizes the site soil cleanup goals for remediation under Reuse Scenario 3.

A cleanup plan is proposed to address existing soil contamination sources at the MTL site. (The FS evaluates soil alternatives. The designation "S" in the descriptions below refers to the numbering system used in the FS report to refer to the alternatives.)

Preferred Soil Alternative (S5 Option A)

The preferred alternative for soil remediation consists of removal and on-site treatment of contaminated soil. This alternative includes:

Table 2

MTL Site Soil Cleanup Goals (mg/kg)

Chemical	Zone 1 Commercial Reuse	Zone 2 Commercial Reuse	Zone 3 Residential Reuse	Zone 4 Public Access	River Park
Benzo(a)anthracene	—	8.5	8.5	8.5	8.5
Benzo(a)pyrene	—	2.0	2.0	2.0	2.0
Benzo(b)fluoranthene	—	7.9	7.9	7.9	7.9
Benzo(k)fluoranthene	—	6.2	6.2	6.2	6.2
Chlordane	—	—	1.5	1.4	1.4
Chrysene	—	—	11.1	11.1	11.1
4,4'—DDD	—	—	—	13.7	13.7
4,4'-DDE	—	—	—	1.4E-01	1.4E-01
4,4'-DDT	—	—	—	1.7E-01	1.7E-01
Dibenz(a,h)anthracene	—	—	2.7E-01	—	2.7E-01
Dieldrin	—	—	—	3.5E-01	3.5E-01
Heptachlor epoxide	—	—	—	—	—
Indeno(1,2,3-cd)pyrene	—	3.0	3.0	3.0	3.0
Aroclor 1260	—	—	1.0	1.0	—

Note: The cleanup goals correspond to soil background concentrations, with the exception of Aroclor 1260, which is based on EPA guidance. Pesticide cleanup goals for Zone 4 Public Access and River Park are based on ecological risk.

- Excavation of areas with contaminated soils that are above cleanup goals. The excavated soils will be stockpiled on-site until they are to be treated. Stockpiles will be managed to prevent contaminated soil migration.

- Treatment of the excavated soil on-site using chemical oxidation.

- Backfilling of the treated soils into the excavations.

- Institutional controls with 5-year site reviews.

The majority of areas with contaminated soil would be excavated to three feet below the surrounding land surface. In some areas, the depth of excavation could be greater. All excavated areas would be sampled to ensure that cleanup levels are met. The treatment system is mobile and requires little setup time. The process is not complicated and requires the addition of oxidizing reagent and water to the soil in a mixer reactor. A process flow diagram is shown in Figure 2.

After treatment, treated soil would be tested to ensure that cleanup levels are met. Any soil not meeting the goals would be retreated. This treatment would also ensure that any soils classified as hazardous waste would achieve the RCRA Land Disposal Restrictions. Treated soil that has met the cleanup goals would be backfilled into the excavated areas and leveled to match the surrounding area. The area would be restored to its original surface conditions. The approximate areas in which this alternative will be used are shown in Figure 3. The oxidation technology would not be used on any areas where localized risks from metals were present. Soil in these areas, if determined to be present, would be excavated and disposed off-site. These areas with potential localized human health and environmental risks from metals are located in Zone 2. Please refer to Section 3 of the FS for a more detailed discussion of these areas.

*Estimated Time for **Design and Construction:** 24 months*
*Estimated Time of **Operation:** 6 to 8 months*
Estimated Capital Cost: $5,061,000
*Estimated Operations and Maintenance Costs **(30-year net present worth):** $27,000*
Estimated Total Cost (net present worth): $5,088,000

Institutional controls for this site would be deed restrictions. These will only be necessary in the areas slated for commercial reuse where the level of cleanup is not as stringent as for areas remediated to residential use or public use. The 5-year reviews are performed to ensure that land use has not changed and that the institutional controls are still effective.

Before implementation of this alternative, bench-scale treatability testing and possible pilot-scale tests of the oxidation technology will be required to determine if the technology can achieve the desired cleanup goals. This testing will also determine the required dosage of the oxidizing reagent. The available literature on this technology for similar situations strongly indicates that the technology can achieve the desired soil cleanup goals; however, no actual testing on MTL soils has been performed yet to verify this. Currently, only a single vendor has been identified to be able to provide an

effective oxidizing reagent. If this particular vendor's reagents cannot achieve the cleanup goals, it may not be possible to use this technology.

Contingency Alternative (S6)

In the event that treatability tests indicate that the preferred alternative is not expected to achieve the cleanup goals or is determined not to be cost effective, a contingency alternative has been selected to be implemented in place of the preferred alternative. The contingency alternative for soil remediation consists of excavation and off-site disposal or reuse of contaminated soil. This alternative includes:

- Excavation of areas with contaminated soils that are above cleanup goals.
- Off-site landfill disposal or reuse of the excavated soil.
- Backfilling of clean fill soils into the excavations.

In this alternative, all source areas would be excavated. Excavated material would be segregated as hazardous and nonhazardous waste. All excavated soil would be disposed off-site. Hazardous soil would be disposed at a hazardous waste landfill. Nonhazardous waste would be disposed at a nonhazardous landfill and/or asphalt batching facility. The excavations would be backfilled with clean soil.

Estimated Time for Design and Construction: 21 months
Estimated Period for Operation: 6 to 9 months
Estimated Capital Cost: $9,718,000
Estimated Operation and Maintenance Cost (30-year net present worth): $27,000
Estimated Total Cost (net present worth): $9,745,000

Accelerated Action for Building 131 and Yacht Club Tank Area

This action is intended to provide remediation for a selected area of the site to be completed in a short time frame. This action was not addressed in the FS as it was identified after the FS was completed. Independent of implementation of the preferred or contingency alternative, the Army wishes to address two small areas of the site for cleanup. One area is located in Zone 3 northeast of Building 131 (designated as Area I in Figure 3). The second area is located on the western side of the River Park (designated as Area M in Figure 3). These two areas represent approximately 1,500 cubic yards of contaminated soil.

The Army wishes to remediate these two areas on a faster track basis than would occur under the preferred or contingency alternative. Currently, the Army is negotiating to transfer a small part of the installation to a commercial establishment. The parcel to be transferred (shown in Figure 4) includes Building 131 and an area of land that includes remediation Area I. Area M is located just north of the yacht club where a UST is located. The club wishes to perform a UST closure, but this closure cannot be accomplished until the surficial soil in Area M is addressed.

To complete the remediation of these two areas, the Army intends to perform a soil removal and off-site disposal/reuse of contaminated soil. This is the same methodology as is described in the contingency alternative, but it would only be applied

to these two areas. The description and analysis of the remediation methodology for the contingency alternative would be the same for this accelerated action.

Estimated Time for Design and Construction: 1 month
Estimated Period for Operation: 1 month
Estimated Capital Cost: $475,000
Estimated Operation and Maintenance Cost (net present worth): $0
Estimated Total Cost (30-year net present worth): $475,000

A technical memorandum providing details on this accelerated action (i.e., costs, volumes, etc.) has been prepared separately from the FS. This memorandum is included as part of the Administrative Record. After public comment on this Proposed Plan is received, the Army will issue a separate ROD for these accelerated actions.

Soil removal and off-site disposal/reuse is to be used for the accelerated action because it is more timely and cost-effective than implementing the remediation technology under the preferred alternative. No bench-scale treatability tests or pilot tests are required for soil removal and off-site disposal/reuse, as are required for chemical oxidation. Chemical oxidation would also be more costly on a per-cubic-yard basis then off-site disposal/reuse for this small soil volume because of the costs necessary to mobilize and perform startup of the on-site system. These costs do not apply to off-site disposal/reuse.

Other Alternatives Evaluated in the FS

The public is invited to comment not only on the preferred cleanup alternative and contingency alternative, but also on the other alternatives that were evaluated in detail. Each of these alternatives is described briefly below. A more detailed description of each alternative can be found in the FS report.

Alternative S1: No Action: This alternative was evaluated in detail in the FS to serve as a **baseline** for comparison with the other remedial alternatives under consideration. Under this alternative, no active or passive treatment or containment of contaminated areas would occur. The only activity would be an EPA-required site review occurring every 5 years.

Estimated Time for Design and Construction: 18 months
Estimated Time of Operation: Indefinitely
Estimated Capital Cost: None
Estimated Operations and Maintenance Costs (30-year net present worth): $27,400
Estimated Total Cost (30-year net present worth): $27,400

Alternative S2: Institutional Actions: Under this alternative, no treatment or containment of contaminated areas would occur. The only effort that would be made to restrict potential exposure to site contaminants would be through the use of institutional controls, such as installing warning signs and fences around contaminated areas and imposing deed restrictions on site real estate transfer.

Estimated Time for Design and Construction: 19 months

Estimated Time of Operation: Indefinitely
Estimated Capital Cost: $12,000
Estimated Operations and Maintenance Costs (30-year net present worth): $166,600
Estimated Total Cost (30-year net present worth): $178,600

Alternative S3: Capping of Soils: Alternative S3 would not involve removal of the contaminated soil areas. Instead, the areas would have a permanent asphalt **cap** placed over the contaminated area. The cap would prevent contact with the contaminated soil. The cap would require long-term maintenance.

Estimated Time for Design and Construction: 32 months
Estimated Period for Operation: Indefinitely
Estimated Capital Cost: $2,637,000
Estimated Operation and Maintenance Cost (30-year net present worth): $2,195,000
Estimated Total Cost (30-year net present worth): $4,832,000

Alternative S4 - Option A: Soil Excavation and Treatment Using On-Site Incineration: In this alternative, all source areas would be excavated. Excavated material would be stockpiled on-site until treatment. Treatment would be conducted using an on-site mobile **incinerator**. Treatment ash would be analyzed and disposed on-site or off-site depending on its characteristics. Clean soil would be used to backfill the excavations.

Estimated Time for Design and Construction: 36 months
Estimated Period for Operation: 1 year to 18 months
Estimated Capital Cost: $12,700,000
Estimated Operation and Maintenance Cost (net present worth): $27,000
Estimated Total Cost (30-year net present worth): $12,727,000

Alternative S4 - Option B: Soil Excavation and Treatment Using Off-Site Incineration: In this alternative, all source areas would be excavated. Excavated material would be stockpiled on-site. Soil would be transported to an off-site incinerator for treatment. Treatment ash would be disposed at the off-site facility. Clean soil would be used to backfill the excavations.

Estimated Time for Design and Construction: 27 months
Estimated Period for Operation: 9 months to 1 year
Estimated Capital Cost: $46,402,000
Estimated Operation and Maintenance Cost (net present worth): $27,000
Estimated Total Cost (30-year net present worth): $46,429,000

Alternative S4 - Option C: Soil Excavation and Treatment Using On-Site Thermal Desorption: In this alternative, all source areas would be excavated. Excavated material would be stockpiled on-site until treatment. Treatment would be conducted using an on-site mobile **thermal desorber**. Removed contaminants would be collected and disposed off-site or treated on-site. The treated soil would be used to backfill the excavations.

Estimated Time for Design and Construction: 36 months
Estimated Period for Operation: 1 year to 18 months
Estimated Capital Cost: $16,057,000
Estimated Operation and Maintenance Cost (net present worth): $27,000
Estimated Total Cost (30-year net present worth): $16,084,000

Alternative S5 - Option B: Soil Excavation and Treatment Using On-Site Solvent Extraction: This alternative is similar to the preferred alternative, except the on-site treatment is by **solvent extraction**. The contaminants in the soil are removed by a nontoxic solvent that contacts the soil. The solvent is collected and contaminants are recovered from the solvent. Solvent is recycled and recovered contaminants are disposed off-site or treated on-site. The treated soil would be used to backfill the excavations.

Estimated Time for Design and Construction: 30 months
Estimated Period for Operation: 9 months to 1 year
Estimated Capital Cost: $10,773,000
Estimated Operation and Maintenance Cost (net present worth): $27,000
Estimated Total Cost (30-year net present worth): $10,800,000

Summary of the Comparative Analysis of Alternatives

EPA uses nine criteria to evaluate each remedial alternative retained for detailed analysis in the FS. The nine criteria are used to select a remedy that meets the national Superfund program goals of protecting human health and the environment, maintaining protection over time, and minimizing untreated waste. Definitions of the nine criteria and a summary of the evaluation of the alternatives using the nine criteria are provided below:

1. *Overall Protection of Human Health and the Environment* addresses how an alternative, as a whole, will protect human health and the environment. This includes an assessment of how public health and environmental risks are properly eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

The preferred alternative (S5 Option A) for addressing contaminated soil would provide overall protection by preventing direct contact and ingestion of site contaminants. Protection is provided by removal and on-site treatment of contaminants. Prior to implementation, treatability tests on the oxidation technology would be conducted to verify that the soil cleanup goals can be achieved in a cost-effective manner. While existing literature on the technology suggests that the goals can be achieved cost-effectively, this must be verified. The contingency alternative (Alternative S6) provides an equal level of overall protection as the site contaminants would be removed and disposed or reused off-site. The contingency alternative is a conventional method with proven success. However, current cost estimations indicate that it is not cost-effective compared to the preferred alternative

Successful application of Alternatives S4 (Options A, B, and C) and S5 Option B would also provide equal overall protection as the preferred and contingency alternatives; the site contaminants under these alternatives are removed and treated on-site, treated off-site, or disposed off-site. As with the preferred alternative, Alternative

S4 Options A and C and Alternative S5 Option B would require treatability testing and/or pilot testing to determine if cleanup goals would be achieved. Alternative S3 also provides protection but at a lesser level than Alternatives S4 through S6. Under Alternative S3, protection is provided by a cap, which would prevent direct contact with contaminated soil; however, contaminants would remain in place and protection would be dependent upon continued cap maintenance. Under Alternatives S1 and S2, protection of human health would be achieved through certain protective measures already taken to prevent people from coming into direct contact with and possible ingestion of contaminated materials at the site, provided such measures are maintained and/or improved. However, risks to the environment would not be controlled through such security measures; therefore, Alternatives S1 and S2 would provide the lowest level of overall protection of all alternatives evaluated.

2. *Compliance with* ***Applicable or Relevant and Appropriate Requirements (ARARs)*** addresses whether or not a remedy complies with all federal and more stringent state environmental and facility siting laws and requirements that apply or are relevant and appropriate to the conditions and cleanup options at a specific site. If an ARAR cannot be met, the analysis of the alternative must provide the grounds for invoking a statutory waiver.

There are no chemical-specific ARARs for this site since there are no promulgated soil cleanup standards. All of the alternatives meet the location-specific and action-specific ARARs (if applicable).

3. *Long-Term Effectiveness and Permanence* refers to the ability of an alternative to maintain reliable protection of human health and the environment over time once the cleanup goals have been met.

Successful application of the preferred alternative or the contingency alternative provides a similar degree of long-term effectiveness and permanence because all material that results in unacceptable risk based on intended use is removed and either treated on-site or taken off-site for treatment or disposal. The same statement can be said for Alternatives S4 (Option A, B, and C) and S5 Option B, as these also provide for on-site or off-site treatment. Alternative S3, which isolates contaminants beneath a cap, provides a lesser degree of effectiveness and permanence, because effective containment of contaminants is dependent on continued cap maintenance. Alternatives S1 and S2 are the least effective and permanent of all alternatives evaluated because contaminants remain in place and exposure is controlled only through continued implementation of security measures at the site.

4. *Reduction of Toxicity, Mobility, or Volume Through Treatment* are three principal measures of the overall performance of an alternative. The amendments to the Superfund statute emphasize that, whenever possible, a remedy should be selected that uses a treatment process to permanently reduce the level of toxicity of contaminants at the site, the spread of contaminants away from the source of contamination, and the volume or amount of contamination at the site.

All of the alternatives, with the exception of S1 and S2, reduce toxicity, mobility, or volume to some extent. A successful application of the preferred alternative would provide the greatest level of reduction because it involves destruction

of the site contaminants. The contingency alternative provides no reduction in toxicity, mobility, or volume through treatment as no treatment is involved. The contingency alternative does reduce contaminant mobility by removal and reuse or disposal in a contained unit.

Alternative S4 Options A and B would provide a similar level of reduction of toxicity, mobility, and volume as the preferred alternative. Alternatives S4 Option C and Alternative S5 Option B provide a lesser degree of reduction because contaminants are separated from the soil and require additional treatment or disposal. Alternative S3 only reduces contaminant mobility as no treatment is performed.

5. *Short-Term Effectiveness* refers to the likelihood of adverse impacts on human health or the environment that may be posed during the construction and implementation of an alternative until cleanup goals are achieved. It also evaluates the time required by the various alternatives to attain protection.

All of the alternatives retained for detailed analysis in the FS would be effective in the short term. Alternatives S1 and S2 would not have significant short-term impacts because no active remedial measures would be taken. However, because of the potential for release of contaminants during the excavation activities under Alternatives S3 through S6, special engineering precautions would be taken to minimize the potential for contaminant emissions to ensure short-term protection of workers and area residents during cleanup-related construction activities. Some risk may be imposed on the community because of heavy truck traffic around the site. This would be required for Alternatives S3 through S6 to mobilize for excavation activities; Alternative S4 Options A and C and Alternative S5 Options A and B to transport on-site treatment equipment to the site; and Alternatives S3, S4 Option B, and S6 for transport of contaminated soil from the site. Impacts from the truck traffic can be minimized by using only truck routes for transportation. For Alternatives S3, S4 Option B, and S6, where off-site transportation of contaminated soil is required, there is an additional risk of a release of the material during transportation (i.e., traffic accident). This risk is considered remote but is a possibility.

Prior to implementing any alternative, the Army estimates that the time to complete documents required by the Federal Facilities Agreement between the Army and EPA and to complete the Procurement process will be approximately 18 to 24 months. This time frame has been included in the "Estimated Time for Construction and Design" in The Preferred Alternative and Other Alternatives Evaluated in the FS sections of this Proposed Plan.

Under Alternative S1, protection would not be achieved for many years. For Alternative S2, an additional 3 months would be required to achieve protection. For Alternative S3, an additional 7 to 10 months is expected to achieve protection. Alternatives S4 and S5 would both require design work and/or bench- and pilot-scale testing. After this work is completed, implementation of Alternative S4 is expected to take 1 year to 18 months. Alternative S5 is expected to take approximately 6 to 8 months to implement. Protection is expected to be achieved for Alternative S6 in approximately 9 months after completion of procurement.

6. *Implementability* refers to the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the alternative.

The preferred alternative is implementable and has been used successfully at other sites. The preferred alternative does use a proprietary reagent that is available through only one vender. Prior to implementation, treatability tests on the oxidation technology would be conducted to verify that the soil cleanup goals can be achieved in a cost-effective manner. While existing literature on the technology suggests that the goals can be achieved cost-effectively, this must be verified. The contingency alternative is proven and can be implemented without the need of treatability testing. Implementation could be lengthy due to the volume of soil and waste that would have to be shipped to a hazardous waste and/or nonhazardous waste disposal facility. Delays in transportation for disposal are possible.

All the options of Alternative S4 may be lengthy to implement due to the trial burns and/or scheduling delays. Alternative S5 Option B could require multiple pilot studies to establish the best specific solvent to use. Alternatives S1 and S2 do not have significant implementation issues since no active actions are taken.

7. *Cost* includes the capital (up-front) cost of implementing an alternative, as well as the cost of operating and maintaining the alternative over the long term, and the net present worth of both capital and operation and maintenance costs.

The capital, operation and maintenance, and total cost for each alternative is provided as part of the site description in the preceding sections on the "Preferred Alternative," "Contingency Alternative," and "Other Alternatives Evaluated in the FS."

8. *State Acceptance* addresses whether, based on its review of the RI/FS and Proposed Plan, the State concurs with, opposes, or has no comment on the alternative proposed as the remedy for the site.

MADEP has reviewed the FS and the preferred and contingency alternatives for the MTL site. MADEP prefers that a permanent solution be selected if the aspects of the other eight criteria are relatively equal. Both the preferred and contingency alternatives represent permanent solutions.

9. *Community Acceptance* addresses whether the public concurs with the Proposed Plan. Community acceptance of this Proposed Plan will be evaluated based on comments received at the upcoming public meetings and during the public comment period.

A summary table that provides a comparison for the alternatives for the first six criteria is provided as Table 3.

Of the nine criteria, protection of public health and compliance with all applicable and relevant and appropriate requirements are considered threshold requirements that must be met by all remedies, unless, in the case of ARARs, there has been a proper invocation of a statutory waiver. The consideration of alternatives is

balanced with respect to long-term effectiveness and permanence; reductions of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. State and community concerns are considered as modifying criteria factored into a final balancing of all criteria to select a remedy. Consideration of state and community comments may prompt a modification on aspects of the preferred alternative or a decision that another alternative considered provides a more appropriate balance.

Rationale for Proposing the Preferred Alternative

Based on current information and analysis of the RI and FS reports, the preferred alternative for the MTL site is consistent with the requirements of the Superfund law and its amendments, specifically Section 121 of CERCLA, and to the extent practicable, the **National Contingency Plan** (NCP). Except for the No Action (S1), Institutional Actions (S2), and Capping (S3) alternatives, successful application of any of the alternatives presented in this Proposed Plan would provide overall protection of human health and the environment. Alternatives S1 and S2 cannot be selected for implementation because they do not provide this protection. Alternative S3 provides protection but at a lesser level than Alternatives S4 through S6. Under Alternative S3, protection is provided by a cap that would prevent direct contact with contaminated soil; however, contaminants would remain in place and protection would be dependent on continued cap maintenance.

During analysis, however, the preferred alternative identified in this Plan is more cost effective compared to the other alternatives considered that provide an equal maximum level of overall protection. The preferred alternative is also more readily implementable than the other alternatives, with the exception of the contingency alternative (S6). All on-site treatment alternatives would require treatability and/or pilot testing. Such testing for the preferred alternative would be more easily and quickly conducted than the other treatment alternatives. In full-scale operation, the on-site oxidation technology is simplistic and requires only conventional equipment at the site. The treatment system can be assembled and be operational in a single day. Soil can be processed at a fairly fast rate such that treatment can be completed in as little as 46 days. No other on-site treatment alternative evaluated can treat the soil this quickly.

There are also potential implementation delays for the contingency alternative. Although this alternative requires no treatability or pilot testing or on-site treatment, delays are possible in the transportation of contaminated soil for off-site disposal or reuse. These delays would occur if the intended disposal/reuse facility could not receive the contaminated material in a timely manner. If such delays are extensive, implementation of the preferred alternative could be faster than the contingency alternative.

In addition, the preferred alternative would achieve the best balance among the criteria used by the Army to evaluate the alternatives. The preferred alternative would provide short- and long-term protection of human health and the environment; would attain all federal and state applicable or relevant and appropriate public health and environmental requirements (ARARs); would reduce the volume, mobility, and toxicity of contaminated soil; and would use a permanent solution to the maximum extent practicable.

Table 3

Noncost Comparison of Soil Alternatives

Criteria	Alternative S1 No Action	Alternative S2 Institutional Controls	Alternative S3 Capping of Soils	Alternative S4 Option A Treatment Using On-Site Incineration	Alternative S4 Option B Treatment Using Off-Site Incineration	Alternative S4 Option C Treatment Using Thermal Desorption	Alternative S5 Option A Treatment Using Chemical Oxidation	Alternative S5 Option B Treatment Using Solvent Extraction	Alternative S6 Off-Site Disposal or Reuse
Overall Protection of Human Health and the Environment									
• Protectiveness	Would fail to achieve remedial action objectives for contaminated soils.	Would fail to achieve remedial action objectives for contaminated soils.	Would protect human health and the environment by preventing direct human contact with risk-based soils.	Would protect human health and the environment by permanently destroying all soil contaminants.	Would protect human health and the environment by permanently destroying all soil contaminants.	Would protect human health and the environment by permanently removing contaminants from site soil.	Would protect human health and the environment by permanently destroying contaminants in site soils.	Would protect human health and the environment by extracting contaminants from soils.	Would protect human health and the environment by removing contaminated soils from the site and disposing of them in an approved landfill.
Compliance with ARARs									
• Chemical-Specific	None.	None.	None.	None.	None.	None.	None.	None.	None.
• Location-Specific	Not applicable.	Would meet location-specific ARARs.	Would meet location-specific ARARs.	Would meet location-specific ARARs.	Would meet location-specific ARARs.	Would meet location-specific ARARs.	Would meet location-specific ARARs.	Would meet location-specific ARARs.	Would meet location-specific ARARs.
• Action-Specific	Not applicable.	Not applicable.	Would meet action-specific ARARs.	Would meet action-specific ARARs.	Would meet action-specific ARARs.	Would meet action-specific ARARs.	Would meet action-specific ARARs.	Would meet action-specific ARARs.	Would meet action-specific ARARs.

Table 3

Noncost Comparison of Soil Alternatives (Continued)

Criteria	Alternative S1 No Action	Alternative S2 Institutional Controls	Alternative S3 Capping of Soils	Alternative S4 Option A Treatment Using On-Site Incineration	Alternative S4 Option B Treatment Using Off-Site Incineration	Alternative S4 Option C Treatment Using Thermal Desorption	Alternative S5 Option A Treatment Using Chemical Oxidation	Alternative S5 Option B Treatment Using Solvent Extraction	Alternative S6 Off-Site Disposal or Reuse
Long-Term Effectiveness									
• Adequacy and Reliability of Controls	Not applicable.	Not adequate to meet remedial objectives for contaminated soils.	Asphalt cap would require a long-term maintenance commitment and institutional controls.	Soil contaminants will be destroyed by incineration, thereby eliminating the need for long-term controls.	Soil contaminants will be destroyed by incineration, thereby eliminating the need for long-term controls.	Soil contaminants will be removed and treated separately, thereby eliminating the need for long-term controls.	Soil contaminants will be destroyed by chemical oxidation, thereby eliminating the need for long-term controls.	Soil contaminants will be extracted, thereby eliminating the need for long-term controls.	Contaminated soils will be removed from the site; however, disposed soils will have to be managed in a landfill indefinitely.
• Magnitude of Residual Risk	Risk not reduced.	No reduction in risk to environmental receptors.	Residual risk minimized as long as cap is properly maintained.	Risk reduced to background levels of contaminants (within NCP acceptable levels).	Risk reduced to background levels of contaminants (within NCP acceptable levels).	Risk reduced to background levels of contaminants (within NCP acceptable levels).	Risk reduced to background levels of contaminants (within NCP acceptable levels).	Risk reduced to background levels of contaminants (within NCP acceptable levels).	Risk reduced to background levels of contaminants (within NCP acceptable levels).
Reduction of Toxicity, Mobility, and Volume of Contaminants Through Treatment									
• Treatment Process Used and Materials Treated	Not applicable.	Not applicable.	An asphalt cap will provide a physical barrier preventing direct human contact with risk-based contaminated soils.	Incineration will permanently remove contaminants of concern by thermal destruction.	Incineration will permanently remove contaminants of concern by thermal destruction.	Thermal desorption will permanently remove contaminants from site soil to be treated or destroyed separately.	Chemical oxidation will permanently destroy soil contaminants.	Solvent extraction will permanently remove soil contaminants and subsequently treat them.	Excavation and off-site disposal does not treat or destroy contaminants but will limit their mobility.

Table 3

Noncost Comparison of Soil Alternatives (Continued)

Criteria	Alternative S1 No Action	Alternative S2 Institutional Controls	Alternative S3 Capping of Soils	Alternative S4 Option A Treatment Using On-Site Incineration	Alternative S4 Option B Treatment Using Off-Site Incineration	Alternative S4 Option C Treatment Using Thermal Desorption	Alternative S5 Option A Treatment Using Chemical Oxidation	Alternative S5 Option B Treatment Using Solvent Extraction	Alternative S6 Off-Site Disposal or Reuse
• Amount of Hazardous Materials Treated or Destroyed	None.	None.	None.	All soil contaminants of concern will be destroyed.	All soil contaminants of concern will be destroyed.	Soil contaminants of concern will be removed and treated or disposed.	Soil contaminants will be permanently destroyed.	Soil contaminants will be extracted from soil and treated.	None. Contaminated soils will not be treated but will be contained.
• Degree of Expected Reduction in Toxicity, Mobility, and Volume	None.	None.	None.	Toxicity, mobility, and volume of contaminants will be virtually eliminated.	Toxicity, mobility, and volume of contaminants will be virtually eliminated.	Toxicity, mobility, and volume of contaminants will be virtually eliminated.	Toxicity, mobility, and volume of contaminants will be significantly reduced.	Toxicity, mobility, and volume of contaminants will be significantly reduced through removal of contaminants from site soil.	Only the mobility of contaminants will be significantly reduced.
• Degree of Irreversibility	Not applicable.	Not applicable.	Completely reversible.	Irreversible.	Irreversible.	Irreversible.	Irreversible.	Irreversible.	Irreversible.
• Type and Quantity of Residuals Remaining	All soil contaminants will remain.	All soil contaminants will remain.	All soil contaminants will remain.	No residual contamination expected to remain.	No residual contamination expected to remain.	No residual contamination expected to remain.	No residual contamination expected to remain.	No residual contamination expected to remain.	No residual contamination expected to remain.

Table 3

Noncost Comparison of Soil Alternatives (Continued)

Criteria	Alternative S1 No Action	Alternative S2 Institutional Controls	Alternative S3 Capping of Soils	Alternative S4 Option A Treatment Using On-Site Incineration	Alternative S4 Option B Treatment Using Off-Site Incineration	Alternative S4 Option C Treatment Using Thermal Desorption	Alternative S5 Option A Treatment Using Chemical Oxidation	Alternative S5 Option B Treatment Using Solvent Extraction	Alternative S6 Off-Site Disposal or Reuse
Short-Term Effectiveness									
• Protection of Community During Implementation	Not applicable.	Institutional controls would restrict direct contact with soils.	Erosion and sedimentation as well as dust controls would be implemented during paving operations.	Erosion and sedimentation as well as dust controls would be implemented during excavation. Heavy truck traffic would result.	Erosion and sedimentation as well as dust controls would be implemented during excavation. Heavy truck traffic would result.	Erosion and sedimentation as well as dust controls would be implemented during excavation.	Erosion and sedimentation as well as dust controls would be implemented during excavation.	Erosion and sedimentation as well as dust controls would be implemented during excavation.	Erosion and sedimentation as well as dust controls would be implemented during excavation. Heavy truck traffic would result.
• Protection of Workers	Not applicable.	Not applicable.	Workers would be adequately protected during construction.	Workers would be adequately protected during soil remediation.	Workers would be adequately protected during soil remediation.	Workers would be adequately protected during soil remediation.	Workers would be adequately protected during soil remediation.	Workers would be adequately protected during soil remediation.	Workers would be adequately protected during soil remediation.
Implementability									
• Ability to Construct and Operate the Technology	Not applicable.	Not applicable.	Asphalt capping uses ordinary paving techniques.	Mobile incinerators are widely used and easily constructed and operated. Test burns are required.	Off-site incinerators exist and are easily accessed.	Thermal desorption units are commercially available and easily operated. Pilot tests are required.	Mobile chemical oxidation units can be easily installed and operated.	Solvent extraction units are commercially available and easily installed and operated.	Excavation and off-site disposal can be easily implemented through regular excavation activities.
• Ease of Site Preparation	Not applicable.	Not applicable.	Easily performed.	No site preparation needed.	No site preparation needed.	No site preparation needed.	No site preparation needed.	No site preparation needed.	No site preparation needed.

Table 3

Noncost Comparison of Soil Alternatives (Continued)

Criteria	Alternative S1 No Action	Alternative S2 Institutional Controls	Alternative S3 Capping of Soils	Alternative S4 Option A Treatment Using On-Site Incineration	Alternative S4 Option B Treatment Using Off-Site Incineration	Alternative S4 Option C Treatment Using Thermal Desorption	Alternative S5 Option A Treatment Using Chemical Oxidation	Alternative S5 Option B Treatment Using Solvent Extraction	Alternative S6 Off-Site Disposal or Reuse
• Ease of Undertaking Additional Remedial Actions	Not applicable.	Not applicable.	Will not interfere with any additional remedial actions.	Will not interfere with any additional remedial actions.	Will not interfere with any additional remedial actions.	Will not interfere with any additional remedial actions.	Will not interfere with any additional remedial actions.	Will not interfere with any additional remedial actions.	Will not interfere with any additional remedial actions.
• Ability to Monitor Effectiveness	Not applicable.	Not applicable.	Cap will be periodically inspected for signs of deterioration and damage.	Treated soils and site excavations will be tested to ensure that treatment standards are met.	Treated soils and site excavations will be tested to ensure that treatment standards are met.	Treated soils and site excavations will be tested to ensure that treatment standards are met.	Treated soils and site excavations will be tested to ensure that treatment standards are met.	Treated soils and site excavations will be tested to ensure that treatment standards are met.	Confirmatory sampling will ensure complete removal of contaminated soil.
• Ability to Obtain Approval from Other Agencies	Not applicable.	Deed restrictions should not be difficult to obtain.	Approval from the state may be difficult to obtain.	Approval not needed.	Approval not needed.	Approval not needed.	Approval not needed.	Approval not needed.	Approval by a landfill may be difficult to obtain.
• Availability of Materials	Not applicable.	Materials for security measures are readily available.	Materials are readily available.	Materials are readily available.	Materials are readily available.	Materials are readily available.	Materials are readily available.	Materials are readily available.	Materials are readily available.
• Availability of Unusual or Special Services	Not applicable.	Not applicable.	Not needed.	Readily available.	Readily available.	Readily available.	Readily available.	Readily available.	Not needed.

When compared to other alternatives that provide an equal level of overall protection as the preferred alternative (S4 through S6), evaluation of the preferred alternative for short-term effectiveness, long-term effectiveness, and the attainment of ARARs shows a similar comparison with the other alternatives. In regards to reduction of volume, mobility, and toxicity of the contaminants, the preferred alternative and Alternative S4 Options A and B provide the same level of reduction as the contaminants are destroyed. Alternative S4 Option C and Alternative S5 Option B provide a lesser level as the contaminants are separated from the soil but would require further treatment. The contingency alternative provides the least level of reduction as the alternative reduces contaminant mobility only.

The preferred alternative is also the most cost effective for alternatives that can achieve overall protection of human health and the environment. The present worth value of the preferred alternative ($5,088,000) is approximately one half that the next most cost effective alternative, which is the contingency alternative ($9,745,000). Present worth values of the remaining alternatives range from $10,800,000 for Alternative S5 Option B to $46,429,000 for Alternative S4 Option B.

The one potential drawback to the preferred alternative is that treatability tests must first be conducted to verify that the oxidation technology can achieve the cleanup goals and show that the goals can be achieved in a cost-effective manner.

Rationale for Selecting the Contingency Alternative

The contingency alternative shall be selected for full-scale implementation at the site if either of the following two conditions occur:

1. The oxidation treatability tests for the preferred alternative show that the technology cannot achieve the soil cleanup goals.

2. The oxidation treatability tests show that the technology cannot achieve the cleanup goals in a more cost-effective manner than the contingency alternative.

If either of these conditions occur, then the contingency alternative would achieve the best balance among the criteria used by the Army to evaluate the remaining alternatives. The contingency alternative would provide short- and long-term protection of human health and the environment; would attain all ARARs; would reduce the mobility of contaminated soil; and would use a permanent solution to the maximum extent practicable. The contingency alternative is more readily implementable than the remaining alternatives. All on-site treatment alternatives would require treatability and/or pilot testing; no such testing is required for the contingency alternative. If there are no delays in scheduling off-site transportation with the disposal/reuse facility, the contingency alternative can complete the implementation faster than the remaining alternatives.

The contingency alternative is also more cost effective than the remaining alternatives that can achieve overall protection of human health and the environment. The present worth value of the contingency alternative is $9,745,000. Present worth values of the remaining alternatives range from $10,800,000 for Alternative 55 Option B to $46,429,000 for Alternative S4 Option B.

For More Information

If you have any questions about the site or would like more information, you may call or write to:

Jeffrey H. Waugh
U.S. Army Environmental Center
Base Closure Division
Building E4480
APG-EA, Maryland 21010-5401
(410) 671-1615

Robert Chase
Public Affairs Office
Army Research Laboratory Caretaker
395 Arsenal Street
Watertown, Massachusetts 02172-2700
(617) 753-3806

Meghan Cassidy
Remedial Project Manager
U.S. Environmental Protection Agency, Region I
JFK Federal Building
HBT
Boston, Massachusetts 02203-2211
(617) 573-5785

Albe Simenas
Project Manager
Massachusetts Department of Environmental Protection
One Winter Street
Boston, Massachusetts 02108
(617) 292-5507

Glossary

Administrative Record: A record of all public documents containing information relevant to a particular site. This record is maintained in an area or areas accessible to the public.

Applicable or Relevant and Appropriate Requirements (ARARs): ARARs include any federal and more stringent state environmental or facility siting statute or regulation that pertains to protection of public health and the environment in addressing certain site conditions or using a particular cleanup technology at a Superfund site. A state law to preserve **wetland** areas is an example of an ARAR. EPA must consider whether a remedial alternative meets ARARs as part of the process for selecting a cleanup alternative for a Superfund site.

Baseline: With respect to the alternatives evaluated, a statement of existing conditions and their relative consequences should no further action be taken.

Cap: A surface covering placed over contaminated material to isolate it from surface contact.

Chemical Oxidation: A chemical treatment method used to destroy organics by chemical reaction that detoxifies or breaks down contaminants to a nonhazardous form.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The Act created a program to investigate and clean up abandoned or uncontrolled hazardous substance sites.

Design and Construction: The tasks necessary to implement an alternative that take place before the alternative operation. These tasks include completion of all regulatory reports, determining and designing how the alternative will be implemented, and assembling the necessary components on-site to operate the alternative.

Feasibility Study (FS) Report: Report that summarizes the development and analysis of remedial alternatives that EPA considers for the cleanup of Superfund sites.

Groundwater: Water found beneath the earth's surface that fills pores between materials such as sand, soil, gravel and cracks in bedrock and often serves as a principal source of drinking water.

Incinerator: Any structure or furnace used to burn waste substances and in which all the factors of combustion, such as temperature, can be controlled.

Massachusetts Contingency Plan (MCP): A Commonwealth of Massachusetts regulation under the Massachusetts Superfund Law established in 1988 and revised in 1993. This regulation establishes procedures for cleanup of the Commonwealth's waste disposal sites.

National Contingency Plan (NCP): A federal regulation established under CERCLA to provide organizational structure and procedures for preparing and responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants.

National Priorities List (NPL): EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund.

Net Present Worth: The amount of money necessary to secure the promise of future payment, or series of payments, at an assumed interest rate.

Operable Unit: A subpart of a CERCLA site that has significantly differing characteristics from the remainder of the site and is handled separately from the rest of the site.

Operation: The tasks necessary to implement an alternative to actually perform the remedial action, such as soil treatment.

Record of Decision (ROD): A public document that explains the cleanup alternative to be used at a National Priorities List (NPL) site. The ROD is based on information and technical analysis generated during the RI/FS and on consideration of the public comments and community concerns.

Remedial Action Plan: A document prepared as part of the MCP process that evaluates and selects a remedial action alternative for site cleanup.

Remedial Alternative: Option evaluated by EPA to address the source and/or migration of contaminants at a Superfund site to meet health-based cleanup goals.

Remedial Investigation (RI): The RI determines the nature and extent and composition of contamination at a hazardous waste site, and directs the types of cleanup options that are developed in the FS.

Sediments: The sand or mud found at the bottom and sides of bodies of water, such as creeks, rivers, streams, lakes, swamps, and ponds. Sediments typically consist of soil, silt, clay, plant matter, and sometimes gravel.

Solvent Extraction: A separation method used to remove organics from soil by introducing a solvent to the soil. The contaminants dissolve into the solvent; the solvent is then separated from the soil, thereby removing contaminants from the soil.

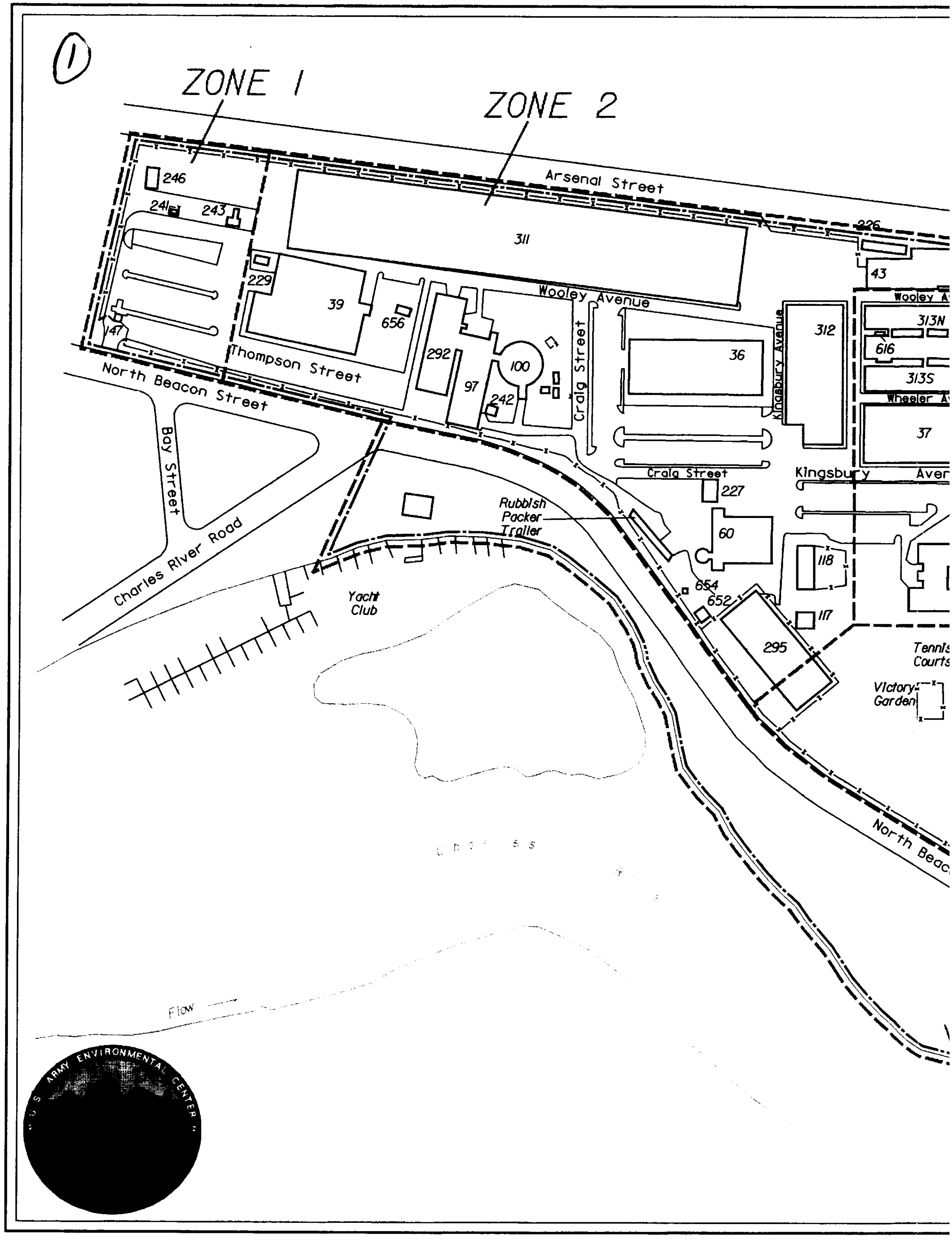
Solvents: Liquids capable of dissolving other liquids or solids to form a solution.

Source: Area at a hazardous waste site from which contamination originates.

Superfund: The program created under CERCLA to investigate and clean up abandoned or uncontrolled hazardous substance sites.

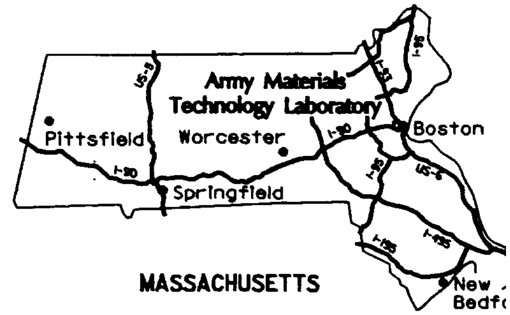
Surface Water: Bodies of water on the surface of the earth, such as rivers, lakes, and streams.

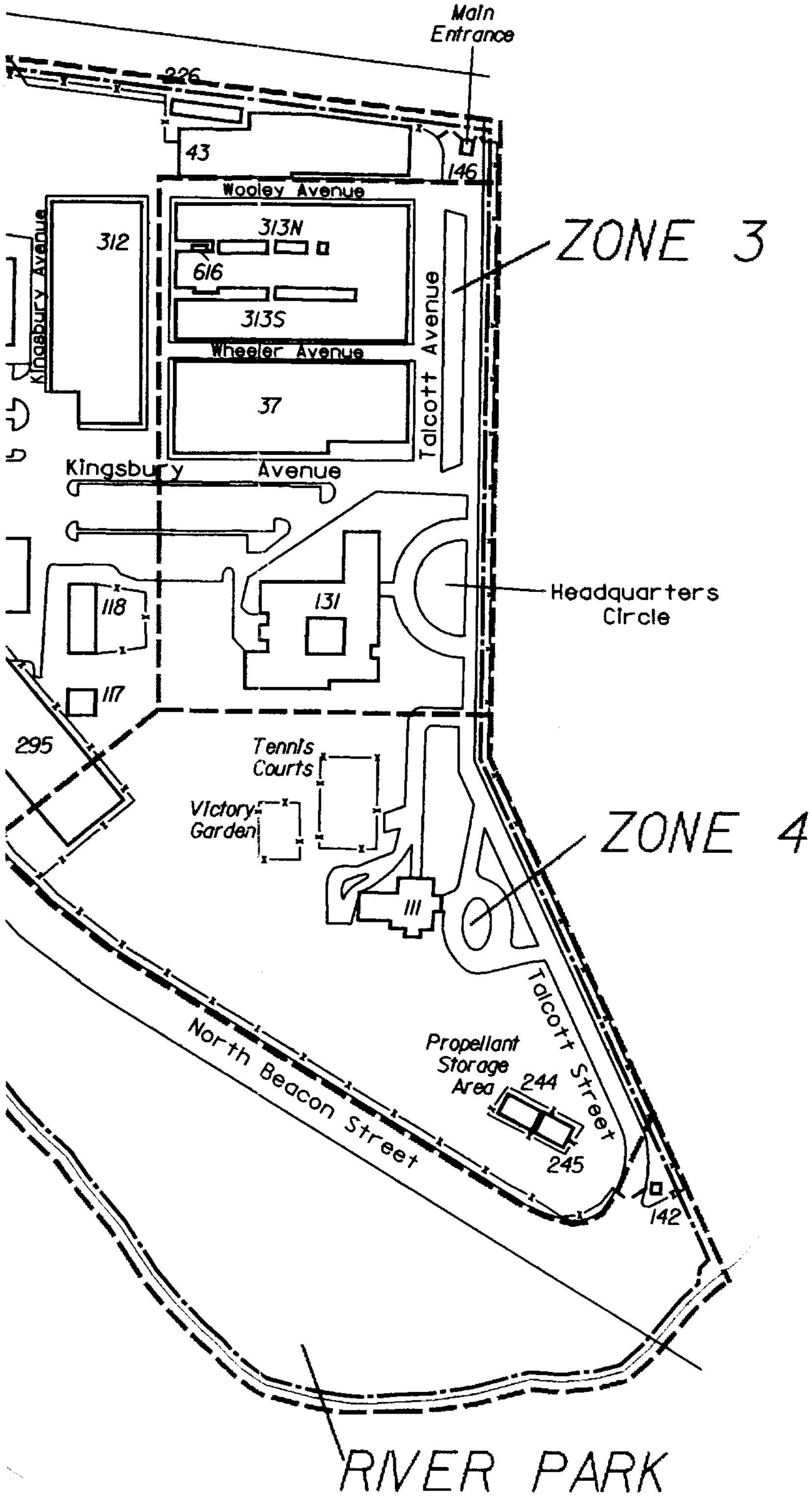
Thermal Desorber: An aeration method used to remove organic compounds from contaminated soil by inducing air flow through heated soil to transfer organics from the soil to the air.



(1)
ZONE 1
ZONE 2
Arsenal Street
246
241
243
311
226
43
229
39
656
Wooley Avenue
Wooley Av
313N
616
313S
Wheeler Av
37
312
36
Kingsbury Avenue
Craig Street
147
292
100
97
242
Thompson Street
North Beacon Street
Bay Street
Charles River Road
Craig Street
227
Kingsbury Aven
Rubbish Packer Trailer
60
118
654
652
117
295
Yacht Club
Tennis Courts
Victory Garden
North Beac
Flow
U.S. ARMY ENVIRONMENTAL CENTER

2





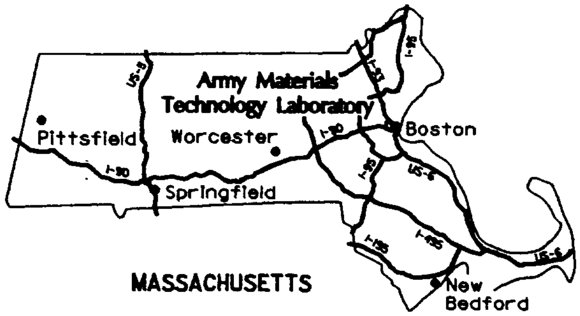
Army Materials Technology Laboratory
Watertown, MA

Figure 1
Site Plan with Proposed Reuse Zone

Zone Boundary

Scale
0 meters
0 feet

13–DEC–1995



3

Army Materials
Technology Laboratory
Watertown, MA

Figure 1
Site Plan with Proposed Reuse Zones

— — — Zone Boundary

Scale

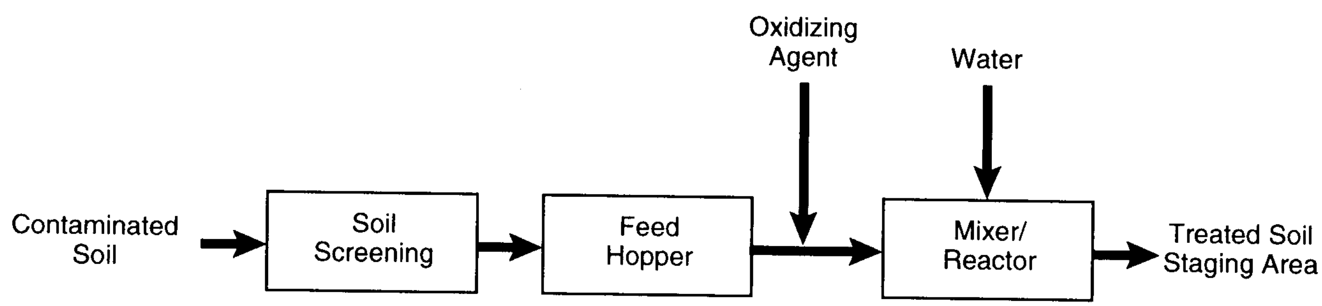
0 meters 150

0 feet 500

N

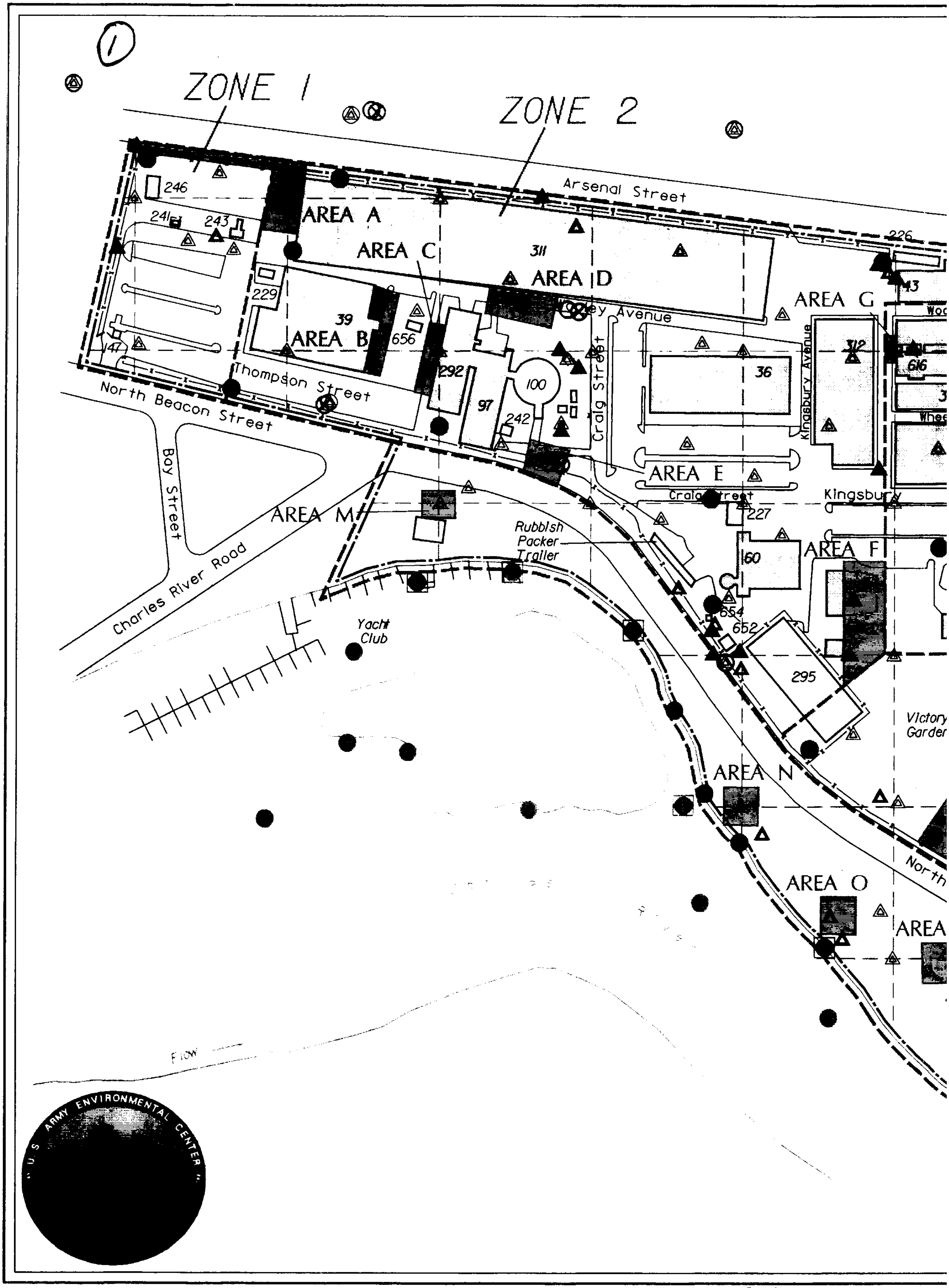
13–DEC–1995

WESTON

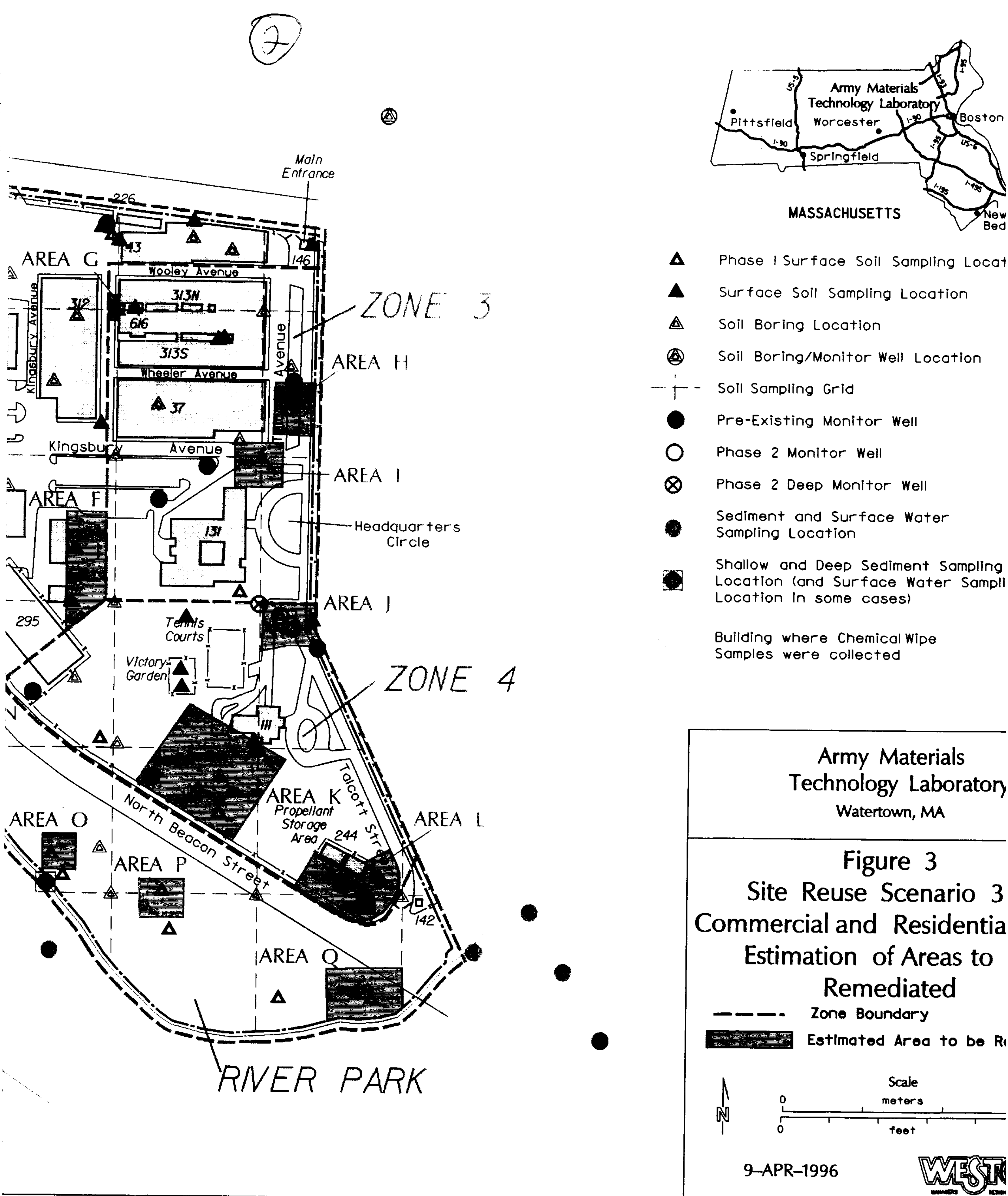


95P-5641 12/19/95

FIGURE 2 CHEMICAL OXIDATION PROCESS FLOW DIAGRAM



1
ZONE 1
ZONE 2
Arsenal Street
AREA A
AREA C
AREA D
AREA B
AREA G
AREA E
AREA M
AREA F
AREA N
AREA O
246
241
243
311
229
39
656
292
100
97
242
36
312
616
226
227
160
654
652
295
147
Thompson Street
North Beacon Street
Bay Street
Charles River Road
Craig Street
Kingsbury Avenue
Kingsbury
Rubbish Packer Trailer
Yacht Club
Victory Garden
Flow
U.S. ARMY ENVIRONMENTAL CENTER

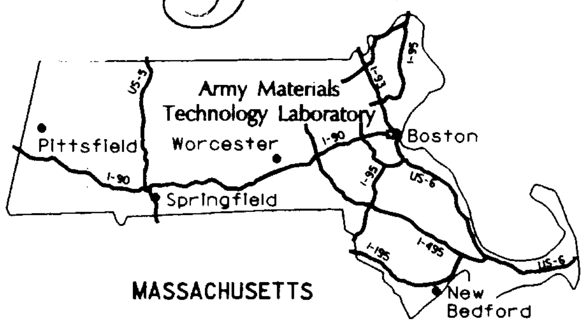


Army Materials Technology Laborator
Watertown, MA

Figure 3
Site Reuse Scenario 3
Commercial and Residentia
Estimation of Areas to
Remediated

9-APR-1996

3



Phase I Surface Soil Sampling Location

Surface Soil Sampling Location

Soil Boring Location

Soil Boring/Monitor Well Location

Soil Sampling Grid

Pre-Existing Monitor Well

Phase 2 Monitor Well

Phase 2 Deep Monitor Well

Sediment and Surface Water Sampling Location

Shallow and Deep Sediment Sampling Location (and Surface Water Sampling Location in some cases)

Building where Chemical Wipe Samples were collected

Army Materials Technology Laboratory
Watertown, MA

Figure 3
Site Reuse Scenario 3 – Commercial and Residential Reuse Estimation of Areas to be Remediated

Zone Boundary

Estimated Area to be Remediated

Scale
0 meters 150
0 feet 500

N

9–APR–1996

WESTON

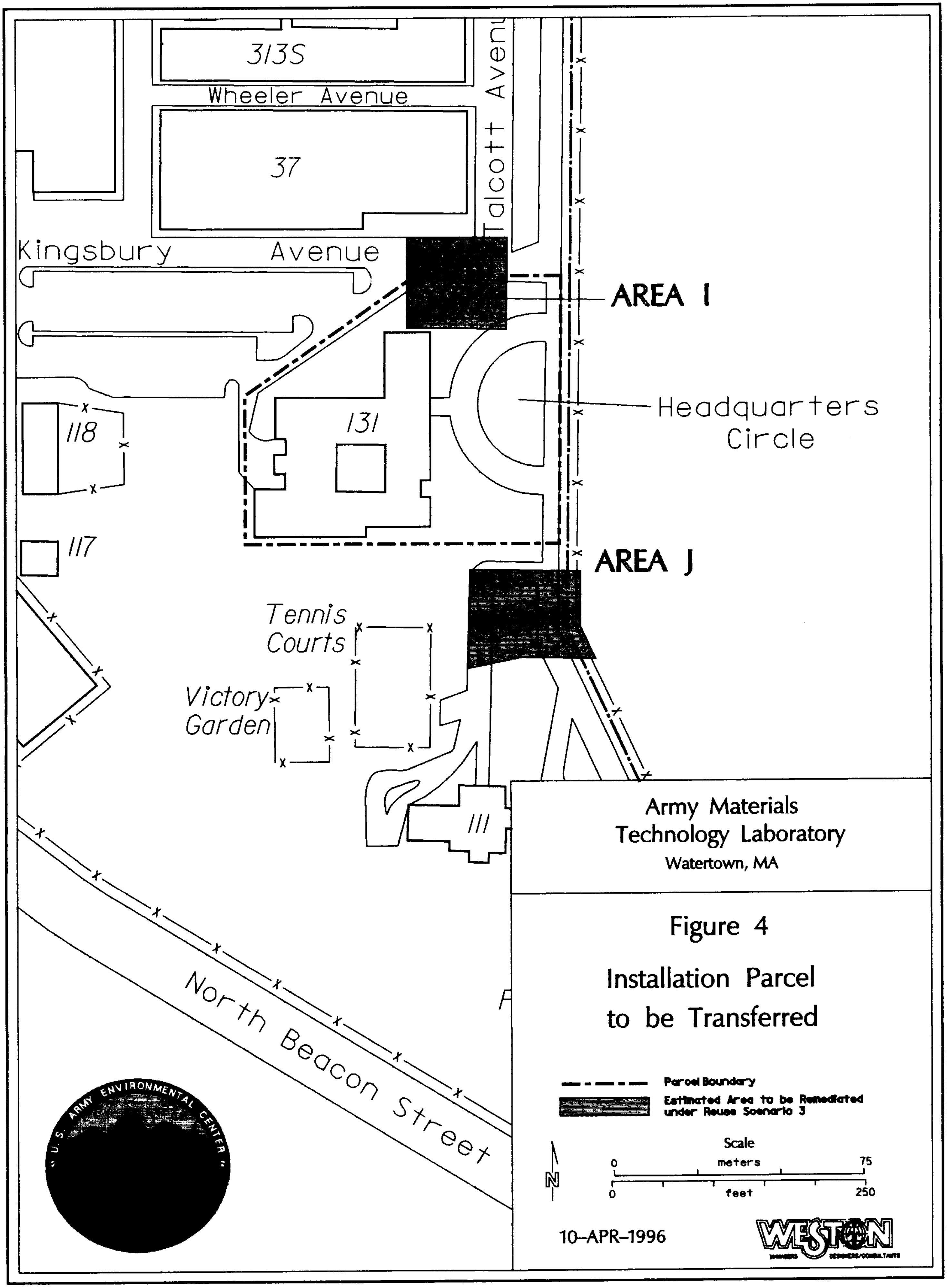


Figure 4

Installation Parcel to be Transferred

Mailing List Additions

If you or someone you know would like to be placed on the MTL Site mailing list, please fill out and mail this form to:

Sgt. Stephen Valley
Army Research Laboratory Caretaker
Public Affairs Office
395 Arsenal Street
Watertown, Massachusetts 02172-2700

Name: ______________________________

Address: ______________________________

____

Affiliation (if any): ______________ Phone: ______________

UNITED STATES
ARMY RESEARCH LABORATORY CARETAKER
PUBLIC AFFAIRS OFFICE
395 ARSENAL STREET
WATERTOWN, MASSACHUSETTS 02172-2700

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Inside: MTL Site
Proposed Plan